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# **DISCHARGED BUT NOT DISSATISFIED Outcomes and satisfaction of patients discharged from the Edinburgh Trauma Triage Clinic**

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# **DISCHARGED BUT NOT DISSATISFIED**

## **Outcomes and satisfaction of patients discharged from the Edinburgh Trauma Triage Clinic**

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# DISCHARGED BUT NOT DISSATISFIED

## Outcomes and satisfaction of patients discharged from the Edinburgh Trauma Triage Clinic

### ABSTRACT

**Aim.** The Edinburgh Trauma Triage clinic (TTC) streamlines outpatient care through the consultant-led 'virtual' triage of referrals and the direct discharge of minor fractures from the Emergency Department. We compared the patient outcomes for simple fractures of the radial head, little finger metacarpal and fifth metatarsal before and after the implantation of the TTC.

**Patients.** 628 patients who had sustained these injuries over a one year period were identified. There were 337 patients in the pre-TTC group and 289 in the post-TTC group. QuickDASH or Foot and Ankle Disability Index (FADI), EQ-5D, VAS pain score, satisfaction rates and return to work/sport were assessed 6 months post injury. Development of late complications was excluded by an electronic record evaluation at three years post injury. A cost analysis was performed.

**Results.** Outcomes were as good or better post TTC, when compared to pre-TTC scores. At three years, the pre-TTC group required a total of 496 fracture clinic appointments compared to 61 in the post-TTC group. Mean cost per patient was almost fourfold less after the commencement of the TTC

**Conclusion.** Management of minor fractures via the Edinburgh TTC results in clinical outcomes that are comparable to the previous system of routine review. Outpatient work load for these injuries was reduced by 88%.

### CLINICAL RELEVANCE

- The direct discharge of simple fractures via the TTC system offers comparable outcome and satisfaction compared to the tradition of early fracture clinic review
- Significant cost and time savings can be expected while lessening inconvenience to patients

## INTRODUCTION

The Edinburgh Trauma Triage Clinic (TTC) and other Virtual Fracture Clinics (VFC) have come to prominence as Orthopaedic services attempt to streamline outpatient fracture management and reduce unnecessary activity.<sup>1-4</sup> The primary aim of our triage protocol is to ensure that patients referred following injury enter an efficient patient-centred pathway that eliminates unnecessary or untimely appointments. A major component of these systems is the direct discharge of minor, stable injuries from the Emergency Department (ED), which has been shown to reduce fracture clinic workload by 26%.<sup>5</sup> During the development of the TTC, Mason type I and II fractures of the radial head and neck, extra-articular fractures of the little finger metacarpal and any fracture of the fifth metatarsal were considered appropriate for such direct discharge to self-management. Despite positive patient reported outcomes and efficiency savings through the employment of a VFC system<sup>3, 6, 7</sup>, concerns remain regarding the deviation from the BOAST 7 guideline published by the British Orthopaedic Association, which states that all new referrals should be seen in a fracture clinic within 72 hours<sup>8</sup>. Furthermore, the recent NICE guideline (NG38) on the management of non-complex fractures highlighted the need for research comparing the clinical and cost effectiveness of virtual triage versus next-day consultant review.<sup>9</sup> Addressing these concerns is essential for the ongoing implementation of “virtual” trauma triage systems such as the TTC.

The Edinburgh TTC is performed remotely and electronically by Orthopaedic Trauma Consultants who review all ED, Minor Injury Unit (MIU) and General Practitioner (GP) trauma referrals within 48 hours. Injuries directly discharged from the ED are included in this process, ensuring the records and radiographs of all directly discharged patients have been screened by an Orthopaedic Consultant as a means of quality control and an opportunity to identify missed or incorrect diagnoses. Extra-articular fractures of the little finger metacarpal, any fracture of the fifth metatarsal and simple radial neck or head fractures are no longer offered an outpatient appointment unless specifically directed by the triage Consultant based on the presentation radiographs or clinical note. Those discharged are given written advice in the ED and the details of a Nurse Practitioner Helpline, in the case of difficulty.

The aim of this study was to compare the patient reported outcomes and complications in fractures that were managed immediately before and after the implementation of the Edinburgh TTC.

## **PATIENTS AND METHODS**

We performed a retrospective analysis of all patients who presented to our institution over a 12-month period from August 2013 to August 2014 with an isolated fracture of the fifth metatarsal, little finger metacarpal or radial neck/head. This was performed using a bespoke search programme (SAP BusinessObjects, BI Platform 4.1, 2010, SAP, California, United States) of our electronic patient records. Inclusion criteria were any patients 13 year or older who sustained an isolated extra-articular fracture of the little finger metacarpal, any fracture of the fifth metatarsal or radial neck/head fracture. Exclusion criteria were any patients with bilateral injuries of the same type, other fractures of the same limb, patients that required admission for social care reasons, Mason type III radial head or neck fractures and intra-articular fractures of the little finger metacarpal head or base. Our institution is the only orthopaedic department in the region and caters for two Emergency Departments and one Minor Injuries Unit. Permission to access patient records was granted by the local Musculoskeletal Quality Improvement Team.

The TTC was introduced at the midpoint of the 12-month period, splitting the patients into two cohorts: the pre-TTC group, in which all fractures were reviewed in the next-day's fracture clinic, and the post-TTC group, where the injuries were directly discharged at the time of presentation. Direct discharge included the provision of written information relating to injury, expected recovery and contact details of a nurse practitioner helpline in the event of any concerns or if the patient requested review.

### ***Demographic and Injury Data***

The Electronic Patient Records (EPR) of the study group were scrutinized for demographic and injury details and the number of fracture clinic appointments and radiographs following presentation and during a three-year follow up period. The Scottish Index of Multiple Deprivation (SMID) was used to determine the patients socioeconomic status, which is derived from employment, income and benefits, recorded crime rates, housing, health and healthcare use, education and access to services and transport.<sup>10</sup> Patients were allocated according to postcode at the time of presentation, ranging from quintile one (most deprived) to five (least deprived).

Injuries were classified by one of the authors (SPM) using standard presentation radiographs of the foot, hand or elbow. Fractures of the radial head and neck were classified according to the modified Mason classification<sup>11</sup> and included occult fractures suggested by presence of a haemarthrosis indicated by elevated fat pads on the lateral radiograph. Fifth metatarsal fractures were classified according to zones (zone I – base avulsion, zone II – Jones type fracture, zone III – shaft fractures)<sup>12</sup> and little finger metacarpals by anatomical location (base, shaft or neck)<sup>13</sup>.

### ***Management***

Prior to the TTC, these injuries had been managed variably with strapping, casting and orthoses. After the implementation of the TTC, each injury was managed according a standardised protocol that had been agreed with the ED. Casts were no longer recommended for any of the three injuries, with immobilisation (if indicated) in the form of a removable orthosis. Radial head or neck fractures were treated in a collar and cuff, fractures of the little finger metacarpal were managed with buddy strapping with/without a wrist splint, and fractures of the fifth metatarsal were placed in a removable, weight bearing orthosis. All patients were asked to mobilise the affected limb as pain allowed and to wean from immobilisation at the earliest opportunity. Information leaflets provided advice on exercises and the expectation of recovery. Figure 1 shows the information leaflet for fractures of the fifth metatarsal.

### ***Patient Reported Outcome***

Primary outcomes for the study were the QuickDASH (QDASH)<sup>14</sup> (radial neck and little finger metacarpal fractures) or Foot and Ankle Disability Index (FADI)<sup>15</sup> (for metatarsal fractures), EuroQol-5D (EQ-5D)<sup>16</sup>, and treatment satisfaction at six months. A bespoke questionnaire was performed to define return to work, return to sport, satisfaction with treatment (yes or no) and whether, with subsequent injuries of a similar nature, would patients prefer review in a fracture clinic or the TTC.

### ***Service Utilisation***

The EPR for each patient was assessed a second time, three years after injury, to determine the rates of re-referral and complications. The number of fracture clinic appointments and radiographic series undertaken in the pre-TTC group were defined. Evaluation of electronic records three years after injury identified any re-referrals or complications. An NHS secondary care cost analysis was undertaken to assess impact of the TTC on spending. The mean number of appointments, radiographs, physiotherapy appointments and surgical procedures was calculated for each injury group. Prices for each item were based on the listings for 2014 on the Scottish information services division (ISD) website.<sup>17</sup> Operation costs included a 24h inpatient stay. The cost of a TTC review was based on consultant time (three half day sessions x £7,830 per annum<sup>18</sup>) required to run the triage system, divided by the number of records triaged in 2014 (12,069).<sup>5</sup> The relevant costings are included in **Table I**. The cost of any ED review/intervention or any primary care input was not included.

### ***Statistical analysis***

Statistical analysis was performed using SPSS version 24 (SPSS Inc., Chicago, Illinois). The age, injury classification, social deprivation and gender of the pre-TTC and post-TTC groups were compared for each injury to define the case mix. All continuous variables were tested for normality using the Shapiro-Wilks test. Parametric and non-parametric tests were used as appropriate to assess continuous variables for significant differences between groups. Dichotomous variables between groups were assessed using a Chi square exact test. A p-value < 0.05 was considered as significant.

## **RESULTS**

A total of 628 patients were initially identified with two exclusions due to death and incarceration respectively. **Figure 2** displays the patient cohorts, injuries sustained and patient contact rates for each group. **Table II** shows the patient case mix for each injury; there were no statistically significant differences between groups with respect to mean age, mean social deprivation or gender (all  $p \geq 0.05$ ). Injury grade between each group were comparable.

### ***Patient Reported Outcome***

**Table III** displays the patient reported outcomes, mean VAS pain scores and return to work/sport. Only the QDASH and EQ-5D score in the little finger metacarpal groups demonstrated a statistically (but not clinically) significance difference, with improved scores in the post-TTC group. Satisfaction rates between each group were comparable for all injuries. When all injuries were considered together, 95% of the pre-TTC group and 98% of the post-TTC stated they were satisfied with treatment ( $p=0.201$ ). When patients were asked what their preferred treatment would be for a subsequent similar injury, 65% of the pre-TTC group and 75% of the post-TTC group chose TTC direct discharge (Figure 3). That is, 65% of patients who had been brought to fracture clinic pre-TTC indicated that they would have preferred to not have attended.

### *Service Utilisation*

The pre-TTC group required 483 outpatient fracture clinic appointments before discharge in the acute phase, compared to none in the post-TTC group. Within three years of discharge from either the fracture clinic or TTC, six patients (requiring 13 appointments) in the pre-TTC and 29 patients (requiring 61 appointments) in the post-TTC groups had been re-referred to the Orthopaedic service. Therefore, total clinic appointments in the pre-TTC group was 496 compared to 61 in to post-TTC group, representing an 88% reduction in fracture clinic appointment usage for the three injuries over a six-month period. In all but three re-referrals, treatment came in the form of reassurance, with or without referral to physiotherapy. In the remaining three cases, surgery was required for a fifth metatarsal non-union, one in the pre-TTC group and two in the post-TTC group. In each case this was managed using an antegrade intramedullary compression screw. In addition to the presentation radiographs, 188 radiographic series had been performed in the pre-TTC group, compared to 47 in the post-TTC group. In the pre-TTC group 126 patients were referred to physiotherapy, compared to 47 in the post-TTC group.

Cost analysis demonstrated significantly lower costs for each injury when managed by direct discharge via the TTC (**Table IV**). When all injuries were considered together, mean cost per patient was almost fourfold higher in the pre-TTC group (Pre-TTC £201. 95% CI 177.58-236.78 vs Post-TTC £51.50 95% CI 11.96-109.57)



## DISCUSSION

The remote triage and discharge of minor fractures offers an opportunity to reduce the burden on orthopaedic outpatient services and limit patient inconvenience and cost without influencing patient outcome or satisfaction with the care provided. There is growing evidence that certain fractures can be directly discharged from the ED, without compromise to clinical outcome. Five studies have been published examining outcomes and/or satisfaction after the instigation of a direct discharge protocol and, as supported by the present study, have demonstrated favourable results (**Table V**). Importantly, we are the first to demonstrate no difference in validated outcomes and satisfaction rates when a TTC system is directly compared to the traditional early fracture clinic review. These findings address the concerns surrounding the replacement of physical clinical review (as recommended by BOAST 7) with a TTC direct discharge protocol.

Only two PROMs between the pre-TTC and post-TTC groups demonstrated any statistical significance: QDASH and EQ-5D in the little finger metacarpal cohort, both favouring the TTC group. Although statistically significant, the difference between the means is small and likely to be of minimal clinical importance. Furthermore, the completion rate for each group is low, particularly for the Pre-TTC group (21%), which resulted in a large standard deviation due to the inclusion of two particularly high QDASH scores in the pre-TTC group (38 and 41). The reason for these scores was not apparent as neither attended their routine appointment, nor had they later re-engaged with orthopaedic services. The little finger metacarpal fracture follow-up rates are low, especially in the pre-TTC group, introducing the possibility of bias. The difficulties in obtaining comprehensive follow up in this injury group has been previously described, with our figures comparable to a previous report detailing the management of little finger metacarpal fractures via a VFC system.<sup>2, 19</sup> In the present study, 30 of 108 patients in the pre-TTC metacarpal group did not attend their fracture clinic appointment, essentially “self-selecting” to direct discharge.

The difference in fracture clinic utilisation before and after the implementation of the TTC is stark: the post-TTC group required 435 fewer appointment to provide comparable outcomes and satisfaction rates. A secondary care cost analysis revealed significant cost savings though the direct discharge via the TTC of minor fractures. Further savings could be expected with the expansion of the direct discharge protocol. Fractures with low morbidity, an established natural history and low conversion rates to surgery could be considered for inclusion, with

fractures affecting the toes/hallux or phalangeal tuft fractures now being included in our direct discharge policy. Whilst the total number of appointments was less in the post-TTC group, this cohort displayed higher rates of re-referral (pre-TTC 6 vs post-TTC 29). Of the 29 re-referrals, 24 (83%) were self-made via the TTC patient helpline within two months of injury. None of these patients required a change in treatment plan, were seen once in clinic for reassurance, and either discharged or prescribed physiotherapy. Rather than consider the higher re-referral rate in the post-TTC group a shortcoming, we feel it demonstrates the effectiveness of the TTC helpline, which freely offers those patients with concerns or problems an appointment within three days. The majority of patients (75%) in the post-TTC group would prefer to be managed via the TTC if they had the same injury again. Furthermore, the majority (65%) of the pre-TTC group would have preferred direct discharge, rather than the inconvenience of attending a fracture clinic.

Strengths of this study include the large number of participants, the use of validated outcomes and high patient response rates for the radial head/neck and fifth metatarsal fractures. This is the only study to compare the outcomes and satisfaction of patients directly discharged from the ED in a TTC system, to those previously reviewed in a standard fracture clinic. The three-year follow up to define injury complications can be considered comprehensive, as the region is served by a single Orthopaedic department, which also shares the same electronic patient database as the local Hand surgery service. Study limitations include the retrospective nature, the aforementioned low but expected response rate in the little finger metacarpal group, some variation in case mix between groups, and the lack of physical review at the final point of follow up. Furthermore, the cost analysis was basic and lacked detail beyond the effect on orthopaedic department spending, rather than a comprehensive cost effectiveness analysis.

This study further indicates that the routine review of simple isolated fractures of the radial head or neck, little finger metacarpal and fifth metatarsal is not necessary. Patient functional outcomes and satisfaction were comparable whether the patient was reviewed in fracture clinic or not. The cost and time savings are striking, and allow surgeons to concentrate on those injuries that require a more complex assessment and treatment plan.

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## TABLES

Item	Cost per item
<b>Orthopaedic staff</b>	
TTC consultation	£1.95
Orthopaedic appointment	£99.00
Physiotherapy	£58.45
<b>Operations</b>	
5 <sup>th</sup> metatarsal non-union intramedullary fixation	£3944.00
<b>Radiology</b>	
Hand/elbow/foot series	£39.63

Table I. Cost of Orthopaedic secondary care interventions.

	Radial head/neck fractures			Little finger metacarpal fractures			Fifth metatarsal fractures		
	Pre-TTC	Post-TTC	<i>P</i> value	Pre-TTC	Post-TTC	<i>P</i> value	Pre-TTC	Post-TTC	<i>P</i> value
<b>Age (yrs)</b> (mean, range)	40, 12-90	41, 13-73	0.965†	28, 15-73	25, 13-74	0.155†	42, 14-85	44, 12-93	0.458†
<b>Gender</b>									
Male (n, %)	60, 51	44, 39		92, 85	73, 83		42, 38	42, 48	
Female (n, %)	58, 49	70, 61	0.061*	16, 15	15, 17	0.67*	69, 62	45, 52	0.67*
<b>SIMD (n, %)</b>									
1	12, 10	13, 11		25, 24	24, 28		13, 14	14, 16	
2	27, 23	28, 25		30, 28	19, 22		31, 28	12, 14	
3	21, 18	20, 18		22, 21	20, 23		21, 19	16, 19	
4	24, 21	22, 20		19, 18	11, 13		17, 15	11, 16	
5	33, 28	29, 26	0.989*	10, 9	13, 15	0.514*	26, 24	33, 24	0.78*

\*Chi square

† Mann Whitney U

Table II: Case mix variables. Scottish index of Multiple Deprivation (SIMD).

	Pre-TTC	Post TTC	<i>P value</i>
<b>Little finger metacarpal</b>			
QDASH (median, IQR)	0.0, 7.9	0.0, 0.0	0.001*
EQ-5D (median, IQR)	1.0, 0.2	1.0, 0.0	0.011*
Pain VAS (median, IQR)	0.0, 0.5	0.0, 0.0	0.105
Return to work in weeks (median, IQR)	0.0, 0.0	0.0, 2.0	0.137
Return to sport in weeks (median, IQR)	2.0, 4.0	2.0, 4.0	0.620
<b>Radial head/neck</b>			
QDASH (median, IQR)	0.0, 2.3	0.0, 4.5	0.427
EQ-5D (median, IQR)	1.0, 0.0	1.0, 0.2	0.088
Pain VAS /10 (median, IQR)	0.0, 0.0	0.0, 0.3	0.114
Return to work in weeks (median, IQR)	0.0, 3.0	1.0, 3.5	0.424
Return to sport in weeks (median, IQR)	6.0, 4.3	6.0, 4.0	0.543
<b>Fifth metatarsal</b>			
FADI (median, IQR)	100.0, 5.0	100.0, 3.0	0.165
EQ-5D (median, IQR)	1.0, 0.2	1.0, 0.2	0.540
Pain VAS (median, IQR)	0.0, 1.0	0.0, 0.0	0.064
Return to work in weeks (median, IQR)	2.0, 4.0	1.0, 2.0	0.055
Return to sport in weeks (median, IQR)	6.0, 8.0	6.0, 4.0	0.351
<b>*P value &lt; 0.05</b>			

**Table III: Outcome scores for each group according to injury. Mann Whitney U test used to compare all variables between groups. (\*) P value <0.05.**

		Pre-TTC		Post TTC	
		Mean number (95% CI)	Mean cost (£) (95% CI)	Mean number (95% CI)	Mean cost (£) (95% CI)
<b>Little finger metacarpal fracture</b>					
TTC review	N/A	0.00 (0.00-0.00)	1 (1.00-1.00)	1.95 (1.95-1.95)	
Appointments	1.08 (0.91-1.25)	107.25 (90.49-124.01)	0.08 (0.01-0.17)	7.88 (0.57-16.42)	
Surgery	N/A	0.00	N/A	0.00	
Radiology	0.40 (0.26-0.53)	15.80 (10.43-21.17)	0.06 (0.01-0.12)	2.25 (0.41-4.91)	
Physiotherapy	0.29 (0.06-0.51)	16.78 (3.75-29.81)	0.09 (0.01-0.19)	0.09 (0.01-0.19)	
	<b>Mean cost per patient</b>	<b>£139.83</b> (86.10-288.69)		<b>£12.17</b> (0.58-21.02)	
<b>Radial head/ neck fracture</b>					
TTC review	N/A	0.00 (0.00-0.00)	1 (1.00-1.00)	1.95 (1.95-1.95)	
Appointments	1.25 (1.12-1.39)	124.17 (110.78-137.56)	0.22 (0.07-0.37)	21.71 (7.10-36.32)	
Surgery	N/A	0.00	N/A	0.00	
Radiology	0.25 (0.15-0.35)	9.75 (5.75-14.76)	0.13 (0.04-0.22)	0.70 (0.28-2.07)	
Physiotherapy	0.57 (0.33-0.81)	33.19 (19.01-47.36)	0.08 (0.02-0.13)	4.61 (1.34-7.89)	
	<b>Mean cost per patient</b>	<b>£167.11</b> (127.16-257.23)		<b>£28.97</b> (9.82-44.23)	
<b>5<sup>th</sup> metatarsal fracture</b>					
TTC review	N/A	0.00 (0.00-0.00)	1 (1.00-1.00)	1.95 (1.95-1.95)	
Appointments	2.08 (1.88-2.28)	206.03 (185.92-226.14)	0.33 (0.11-0.56)	7.88 (0.67-16.42)	
Surgery	0.01 (0.01-0.03)	35.53 (3.86-75.94)	0.02 (0.01-0.06)	71.06 (1.04-197.37)	
Radiology	1.05 (0.85-1.23)	41.47 (33.78-49.16)	0.31 (0.07-0.55)	12.30 (2.63-21.96)	
Physiotherapy	0.25 (0.09-0.42)	14.74 (5.20-24.29)	0.34 (0.01-0.70)	20.16 (0.55-40.86)	
	<b>Mean cost per patient</b>	<b>£297.74</b> (210.39-385.15)		<b>£113.35</b> (4.48-316.72)	
<b>Pre-TTC mean cost per patient</b>		<b>£201.56</b> (177.58-236.78)	<b>Post-TTC mean cost per patient</b>	<b>£51.50</b> (11.96-109.57)	

Table IV: Secondary care cost analysis. Not applicable (N/A)

Author	Year	Injury/fracture	Patient (n)	Follow up (months)	Outcome score (mean)	Satisfaction rate
Brooksbank et al <sup>20</sup>	2014	Mallet finger	47	12	2.3*	100%
Jayaram et al <sup>3</sup>	2014	Radial head/neck	155	6	NR	87%
Gamble et al <sup>2</sup>	2015	5 <sup>th</sup> metacarpal	98	12	2.3*	83%
Ferguson et al <sup>1</sup>	2015	5 <sup>th</sup> metatarsal	339	NR	NR	78%
Bhattacharyya et al <sup>6</sup>	2017	Clavicle	62	12	16*	86%

\*QDASH

**Table V: Published studies examining outcomes and satisfaction after the commencement of TTC style direct discharge system. Not reported (NR)**



## **FIGURE LEGENDS**

**Figure 1: Fifth metatarsal fracture information leaflet.**

**Figure 2: Injury breakdown according to type and classification for each group.**

**Figure 3: Preferred treatment pathway if the patient were to suffer the same injury again.**